THE USE OF ELECTRICITY IN SKIN-GRAFTING.[1]

BY JOHN D. RUSHMORE, M.D.,
OF BROOKLYN, NEW YORK,
Professor of Operative and Clinical Surgery in the Long Island College Hospital.

THE use of electricity in skin-grafting in a number of hospital patients has been followed by such gratifying results that the subject has seemed to possess sufficient interest to justify its presentation before this Society. The cases in which the method has been applied were all suffering from chronic ulcers, one or two of them very extensive. In none of the patients has the method been used in fresh wounds accompanied by considerable loss of tissue, as we have here a better method in the use of sliding flaps. If we are careful to check the hæmorrhage, secure a well vascularized flap and bring the parts together with little or no tension in the flap, the healing in almost all cases will be satisfactory. When we desire a better cosmetic effect, as in the face, neck, or other exposed parts of the body, a Thiersch or other transplanted flap will many times give a perfect result; although I think the risks of failure are very much greater than with the sliding flap.

It is, however, in the grafting of old granulating surfaces where the improvement in methods is most needed; for, personally, I confess that with the most careful attention to details I have had many partial successes and not a few complete failures. I suspect that my personal experience has not been unique; and that it would be fair to say that in dealing with a chronic ulcerated surface the results of our efforts to heal them with Reverdin's method has not always been such as to satisfy our earlier expectations.

The other side of the picture is furnished by a quotation from Hamilton's "Principles and Practice of Surgery." The following remarks comprise the results of the observations hitherto made and in which nearly all observers concur:

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[1] Read before the New York Surgical Society, April 27, 1904.

"The more healthy the condition of the granulations the better is the chance of success; indeed, with perfectly healthy granulations success is almost certain. It is not material from what point of the body the graft is taken, although it will be found most convenient to take it from some portion which is thin and flexible. With a pair of mouse-toothed forceps the integument is lifted, and with the knife or scissors cut out. It is generally considered essential that the areolar tissue and fat should not be included in the graft; whether this is a matter of consequence or not I am unable to say; but it is certain that it makes no difference how small the piece may be, and it is not necessary to cut so deep as to draw blood. Having cut out a piece as small as can be conveniently removed, we proceed to divide it into several smaller pieces; nor does the amount of contusion which it suffers in the process seem to affect its vitality. After a trial of several methods of inserting the fragments, I have arrived at the conclusion that if the granulations are fresh and vigorous, there is no better way than simply to lay them upon the surface, without attempting to embed them by incision; nor does it seem to be a matter of any consequence how they lie, whether with the raw surface turned in one direction or the other. The grafts, when several are inserted simultaneously, should be placed at intervals of about one inch apart, as it is observed that the limit of growth of each separate piece does not in general exceed a diameter of one inch or thereabout. In order to retain them in place, I have generally used common adhesive plaster, reinforced by a few turns of the roller. If the operation of grafting is made upon the lower extremities, it will be necessary to impose upon the patient absolute rest in the recumbent position." The dressings are removed after two or three days, the sore cleaned with tepid water and soap, bathed with a weak solution of carbolic acid, and subsequently treated in the usual methods applicable to ordinary ulcers.

These results were secured within three or four years after the introduction of Reverdin's method, long before the days of asepsis; while even antisepsis was still ridiculed by some and half heartily adopted by many; with small grafts cut into still smaller pieces; secured in position by a kind of adhesive plaster then in use, that to some patients proved very irritating, and this plaster was removed in two or three days with the expectation that the grafts laid on and not embedded in the granulations would adhere to the surface of the ulcer instead of the plaster. And yet "with perfectly healthy granulations success was almost certain."

In a paper entitled "Recent Researches in Radio-activity and Electricity: Their Bearing on Radiotherapy; Legal status," read at the New York State Medical Society meeting, January 27, 1904, by J. Sherman Wight, one of the assistant surgeons to the Long Island College Hospital, the author draws attention to the value of electricity in skin-grafting. The method of application and the probable explanation of its action are shown in the following extract from the paper:

"I have been able to show that high frequency discharges will clot blood, acting as a hæmostat, and will coagulate serum albumen; but this is in some degree due to the formation of nitric acid from the air; but there is no destruction of tissue with ordinary care. I have made use of this in sealing surfaces after the removal of several diseased areas, especially in the neighborhood of bone and in fixing grafts to granulating surfaces, the results of which have been so uniformly successful in my experience that I now ask attention to the technique of this method of electric grafting. Render the granulating surface sterile; prepare it to receive the grafts by curetting it thoroughly; and, while it is still oozing, place the grafts of any form desired in position on the surface and bathed in blood; apply the high frequency discharge from a pointed electrode at about one-quarter inch distance over the entire surface till clotting is firm and the grafts are fixed in a dry surface. Serum that is squeezed out in the process of clotting should be sponged off. The dressing consists of three per cent. carbolized vaseline and plain sterile gauze. It is renewed at the end of the third day. The repair follows in the usual way, but takes a shorter course. Repair was hastened in some cases in which the secondary Röntgen rays were used at the end of the first week.

The following cases were subjected to this method of grafting:

Case I.—A. N., aged forty-two years, liquor dealer, eighteen months ago was operated on for varicose veins of the left leg, and the ulcer on the leg healed in the course of ten weeks. The ulcer reopened in two months, attaining the size of a silver dollar, and was treated, with some improvement, to October 26, 1903. It was then given a three days' preparation with soap, water, and dilute carbolic acid. Reverdin grafts were taken from the thigh and applied by the electric method. At the end of a week the healing surface was exposed to the secondary Röntgen rays for ten minutes. This was repeated at intervals of three days. Repair was complete in three weeks and has remained so.

Case II.—Mrs. T., aged thirty-six years, recovered from a cellulitis of the right leg with an ulcerating surface extending from the outer malleolus three and one-half inches, down on the dorsum of the foot, and two inches in width. I grafted the surface with Thiersch grafts by the electric method, November 24, 1903. The secondary rays were not used till the beginning of the second week, and only repeated twice, fifteen minutes at a sitting. Repair was complete by December 29, 1903. I have not seen her since.

Case III.—W. B., aged forty years, mate of a steamship, was admitted to the service of Dr. Bristow at the Long Island College Hospital, Brooklyn, October 11, 1903, suffering with ulcers of both legs, covering the front of the legs and extending around to the calves from the knee to the ankle. The small superficial veins were injected, and the ulcers had increased in severity for the past five months. I saw him on November 27, 1903. There was a high degree of inflammation of both legs. I had them scrubbed with soap and water and washed with alcohol. The same day I grafted the surfaces of the ulcers of the left leg with both Reverdin and Thiersch grafts by the electric method. The next day I grafted the right leg. The dressings were not removed till December 2, when the secondary Röntgen rays were applied for ten minutes. The legs were not again exposed to the secondary rays. December 23, 1903, the right leg was healed, and January 11, 1904, he was discharged from the hospital with repair complete in both legs.

Case IV.—O. A., aged twenty-nine years, housewife. Varicose ulcer of right leg just below the patella for four months. She was admitted to the service of Dr. Bristow at the Long Island College Hospital, December 11, 1903. December 12, 1903, ulcer was curetted and bone drilled under general anæsthesia. December 22, 1903, the case was referred to me, and I grafted a surface two and one-half inches in diameter with Thiersch grafts by the electric method. The wound was dressed every third day till she left the hospital, January 3, 1904. She has since come to my office every week and had the healing surface exposed to the secondary Röntgen rays for fifteen minutes. January 25, 1904, the surface was not fully repaired; it measured one-eighth inch in diameter.

Case V.—E. S. B., aged seventy-three years, first noticed a growth on the tragus of the right ear, January, 1903. It grew larger to about the size of a small almond until August, 1903, when it broke down. It was still discharging, December 29, 1903, when I saw him. I froze the surface with ethyl chlorid, cut off the growth with a pair of scissors, and curetted its base. The high frequency discharge was applied till the surface was dry and a dry dressing put in place. January 4, 1904, the surface was again exposed to the high frequency discharge to fix a small graft in place. January 7, primary Röntgen rays were used for ten minutes. January 12, removal of the dressing started some oozing, and the high frequency discharge was again used. January 18, 20, and 23, the secondary Röntgen rays were used for fifteen minutes, and at the last visit repair was complete, leaving almost no scar. Microscopic examination of the specimen in this case showed the growth to be epithelioma. I shall endeavor to keep the patient under observation for recurrence of the growth.

Case VI.—K. McQ., aged sixty years, housewife. Admitted to the hospital November 17, 1903, suffering with a carbuncle at the back of the neck. Deep incisions were made November 18, 1903. December 19, 1903, the granulating surface, three by two and one-half inches in extent, was grafted by the electric method.

No secondary Röntgen rays were used in this case, and January 25, 1904, there is still a surface of one inch by one-half inch left to heal.

I am able to add one more case to the above list.

Case VII.—Male, aged twenty-five years, entered Long Island College Hospital January 4, 1904, with a large ulcer, eight inches long in lower part of right leg, completely encircling the leg except for a strip of skin one inch wide at the back of the leg. The ulcer was the result of a kick of a horse, and had existed eight months; the borders inflamed; over the fibula was a fusiform mass about three inches long and a half-inch thick, which was suspected to be malignant, but which proved to be inflammatory. After about four weeks' treatment to secure a healthy granulating surface, ten grafts from the sterilized skin of the thigh were placed in the surface and the usual protective dressing applied. This attempt failed. About two weeks after this, Dr. Wight, to whom I referred the case, with the surface apparently in the same condition as when I made my attempt, succeeded in having twenty-eight out of thirty-two grafts hold fast and grow secured in position by the electric methods. The Röntgen has been applied twice. The surface now is healing, but slowly.

A study of these seven cases, which are perhaps as instructive as a larger number, and an opportunity to see the application of the electricity, convinces me that we have in this method of grafting a pretty certain way of fixing the grafts, and I doubt if anything more can be claimed for it. It certainly coagulates the blood and secures the graft in its new position. I doubt the benefit of the secondary application of the Röntgen rays, and whether the healing process goes on any more rapidly than in any other way after fixation of the graft. Of course, the resultant scar is the same as in other methods. Why it is that 12½ per cent. of the grafts did not adhere and grow in the last case reported would be as difficult to answer as why the other 87½ per cent. did. Our knowledge of the causes of success will doubtless explain the causes of failure. While successful grafting by Reverdin's method depends on having a surface as healthy as possible, the granulating surface is never perfectly healthy, as pus is never laudable. It is always in-till December 2, when the secondary Röntgen rays were applied for ten minutes. The legs were not again exposed to the secondary rays. December 23, 1903, the right leg was healed, and January 11, 1904, he was discharged from the hospital with repair complete in both legs.

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In conclusion, I may state that, in our attempts at healing old granulating surfaces with small grafts, we have in the use of the electric method a more exact and successful way than any heretofore employed, by fixing the grafts on the granulating surface.